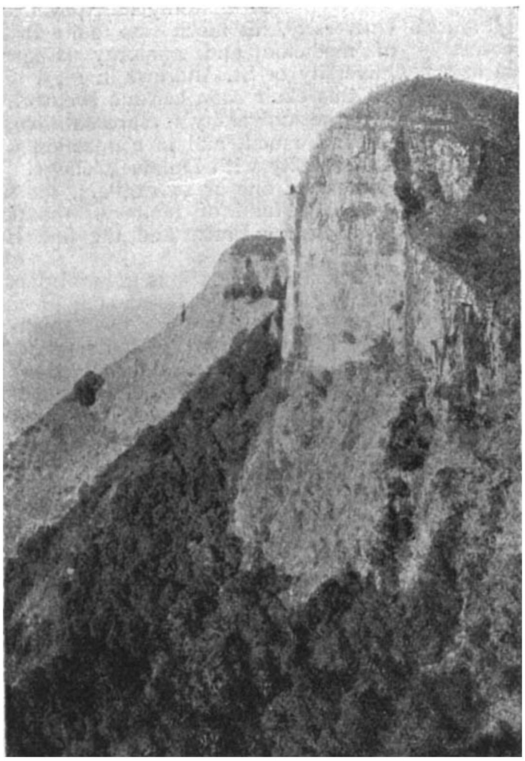
"No mere description," says the author, "can convey an adequate idea of the grandeur of the country between Belvedere and Blyde River Poort, where this stream enters the granitic Low Veld area." The escarpment of the Drackensberg "here forms a fine semi-circular curve, cut into by a number of spruits which give rise to precipitous and densely wooded kloofs. Immediately below the edge of this escarpment runs a massive kranz of quartzite nearly 500 feet in thickness." About a thousand feet below lies the great plain of the Low Country, beyond which, on a clear day, the distant chain of the Lebombo Hills can be discerned. The dip of the Black Reef Series being to the west, the escarpment rises eastward until it culminates in two magnificent bluffs, 3500 feet higher than the Belvedere (see Fig.). North of Belvedere the greater thickness of the quartzites produces, under the profound erosive action of the



Portion of the Great Eastern Escarpment of the Drakensberg, S. of Belvedere, formed by the Black Reef Series.

larger rivers, even more striking scenic effects. Thus the Blyde River is mentioned as having carved out a cañon in the quartzites to a depth of more than 2000 feet.

The Dolomite, owing to its more homogeneous composition and consequent absence of marked horizontal features, is characterised by a different type of scenery. Its vertical jointing, however, gives rise to peculiarly pointed kopjes, recalling portions of the dolomite area in the Tyrol. Northward, from Pilgrim's Rest to Hermansburg, the Blyde River flows in a gorge formed by precipitous walls of dolomite. It then travels in a more open valley; but on leaving the Dolomite it cuts its bed down into the Black Reef quartzites by a succession of cataracts and waterfalls until, joining forces with the Treuer River and the Belvedere Creek, it forms the deep cañon mentioned above.

The Pretoria Series presents in the Lydenburg district no feature, either topographical or geological, of especial interest; the same succession of shales, quartzites, and intrusive sheets is met with as in the country further south. The only noteworthy point is the marked thinning out of the series which is observable to the north of Lydenburg. The middle member of the system—the Dolomite—undergoes no great change in thickness, although a thick bed of quartzite (the "Blyde Quartzites") makes its appearance for the first time in the middle of the series; but while the upper member—the Pretoria Series—becomes much attenuated, the lower member—the Black Reef Series—rapidly assumes greater and greater proportions as it is traced northwards. In the extreme eastern portions of the Rand basin, near Springs, the boreholes put down through the Karroo Coal-measures and the Dolomite, to cut the underlying Witwatersrand Beds, showed that the Black Reef Series was represented at the base of the Dolomite by a bed of hard quartzite only 20 feet in thickness (see Hatch, Trans. of the Geol. Soc. of S. Africa, vol. vii., 1904, p. 63). At the Devil's Kantoor, in the Barberton district, it is 110 feet thick; at Mac-Mac, 700 feet; at Belvedere, 1260 feet; while near the northern termination of the Drackensberg, at Marieps Kop, the series reaches 2550 feet. The horizontal distance across the syncline formed by the beds of the Transvaal System, under the Waterberg and Red Granite formations, from Springs to the Drackensberg escarpment, is only about 160 miles, so that the conditions of sedimentation must have changed rather rapidly, the cause of which is not explained.

It will be seen by the free use made of Boer topographical words in the sentence quoted above that the committee appointed by the British Association at its last meeting "to determine the precise significance of topographical and geological terms used locally in South Africa" should serve a useful purpose. The precise meaning of such words as *kranz, bult, vlei,* and *kloof* will not be known to the generality of English readers, although *kopje, veld,* and *spruit* may have been made familiar by the late war. The report is accompanied by excellent colour-printed maps, and illustrated by beautiful photographic reproductions; but, unfortunately, it lacks an index, and has not even a paged table of contents.

F. H. HATCH.

THE HISTORY OF ARITHMETICAL NOTATION.

THE invention of the decimal notation, which involves the use of zero and the assignment of local value to digits, made such an immense alteration in the character of arithmetical calculations that it would be extremely interesting to know its origin. It became familiar in Europe mainly through Mohammedan sources; hence the term Arabic, as opposed to Roman notation. But the discovery of Sanskrit literature and of Indian works on mathematics led to the theory that the real inventors of the system were the Hindus. The object of Mr. Kaye, in the paper referred to below,[1] is to show that this conclusion has been based on insufficient evidence, and that the whole question requires further and more careful consideration, including a critical study of Indian texts, to avoid being misled by spurious documents. Mr. Kaye gives in the first place a series of arguments which go far to prove that there is no trustworthy evidence for the use of the new notation in India

[1] "Notes on Indian Mathematics.—Arithmetical Notation." By R. Kaye. (Journ. and Proc. As. Soc. of Bengal, new series, vol. iii., No. 7, 1907.)

before the ninth century A.D., and that, if a single inscription prove untrustworthy, we shall have to fix the tenth century as the earliest date attested. Another point on which there can be no doubt that he is right is that the Arabic epithet *hindashi*, applied to the decimal notation, certainly does not mean Indian, the word for which is *hindi*, and cannot be connected with *hindashi* by any regular Arabic method of word-formation; not to mention that *hindashi* usually means "geometrical," and was derived from a Persian word by the Arabic lexicographers themselves. There is no probability in favour of Colebrooke's conjecture that the Indian work translated by Alfarazi was entitled "Siddh'anta"; and it is clear enough that after Brahmagupta there was a decline in the study of mathematics in India.

As to Brahmagupta himself, Mr. Kaye points out that in his treatise, side by side with Hero's exact formula for the area of a triangle in terms of the sides, he gives the absurd rule that the product of half the base and half the sum of the other sides is the gross area of a triangle—a survival of a rough approximation similar to those used in Egypt more than two thousand years previously—and this without a word of warning as to when this method would give no approximation at all (though, of course, it should be remembered that in applying this rule, the side most unequal to the others would probably be taken as the "base"). Altogether Mr. Kaye's paper is well worth reading, although he refrains from advancing any definite conclusions of a positive character.

G. B. M.

PROF. J. B. PETTIGREW, F.R.S.

By the death of Prof. Pettigrew another gap has occurred in the able band who, in the last three or four years of the "'fifties" of last century, studied at Edinburgh University. Born in 1834 at Boxhill, in Lanarkshire, young Pettigrew attended first Airdrie Academy and then arts' and a few divinity classes in Glasgow University. Proceeding to the University of Edinburgh as a medical student in 1856, he was first brought into notice in the senior anatomy class of Prof. Goodsir, for by devoting himself to a research on the arrangement of the muscular fibres of the heart he, with 125 marvellous dissections and 120 ingenious drawings, carried off the gold medal. By and by he became president of the Royal Medical Society in Edinburgh, and gave the "Croonian" lecture on the arrangement of the muscular fibres of the heart (after rehearsing it to his fellows in Edinburgh) to the Royal Society of London. He also won the gold medal in the class of medical jurisprudence for an essay on the presumption of survivorship. Next he carried on a research on the cardiac nerves and their connections with the cerebro-spinal and sympathetic system, for which a gold medal was awarded on graduation day, 1861.

After a brief period of office as house-surgeon in Prof. Syme's wards in Edinburgh Infirmary, Pettigrew was appointed assistant curator (under Prof. Flower) in the museum of the Royal College of Surgeons, London. There his remarkable skill in dissection, his stimulating enthusiasm, and his fine preparations of the muscular coats of the stomach, bladder, and other viscera—which he rendered so visible by distending them with coloured plaster of Paris—made his period of office memorable. He also published at this time his memoirs on the arrangement of the muscular fibres of the heart and on the muscular fibres of the stomach and bladder in the Philosophical Transactions; and another memoir on the relations, structure, and functions of the valves of the vascular system in vertebrates (Trans. Roy. Soc. Edin.). He further entered into another field, viz. the mechanism of flight, first prominently brought out in his lecture on the subject at the Royal Institution. This was followed by his elaborate and finely illustrated memoir in the Linnean Transactions, and, in 1879, by his volume on animal locomotion in the International Series.

His health, however, broke down in 1868, and as total blindness was feared he had to relinquish his post at the museum of the Royal College of Surgeons in London and take rest. Improving in health, he, in 1869, accepted the post of curator of the museum of the Royal College of Surgeons in Edinburgh. He held also the offices of pathologist to the Royal Infirmary, lecturer on physiology to the Royal College of Surgeons in Edinburgh, &c. He published in 1874 a volume on the physiology of the circulation in plants, in the lower animals, and in man. Unsuccessfully competing for the chairs of anatomy and physiology in Edinburgh University, his niche was found in the professorship of medicine and anatomy (Chandos chair) at the University of St. Andrews in 1875. His period of office in this chair soon became eventful, as he was appointed the university's representative on the General Medical Council, and in connection with the union of the university with Dundee College. To his labours, and those of one or two others, the university owes the Berry fund of 100,000*l.*, the principal's residence of Scores Park, and the fine Bute Medical Buildings.

In recent years he published various general papers, gave the "Harveian" oration in Edinburgh in 1889, and continued his researches on the mechanism of flight in his private laboratory, where his remarkable machine with its gigantic wings exhibited all his recent experiences. Failing health lately much curtailed his labours, yet, under great weakness, he bravely elaborated a large illustrated work embodying the various researches formerly alluded to and evidences of design in animals. Besides other honours, he received the Godard prize of the French Academy of Sciences, and was made a laureate of the Institute of France.

W. C. M.

W. A. SHENSTONE, F.R.S.

"Distinguished for his skill as an experimenter, for his ability as a teacher, and for his zeal in the introduction of improved methods of teaching physical science as a branch of general education." Such was the statement of his qualifications for admission to the Royal Society, of which Shenstone became a Fellow in 1898. By his friends he will be remembered for his enthusiastic eagerness in the pursuit of science, by unselfish devotion to what he thought his duty, by his loyalty and good-fellowship, and by the indomitable cheerfulness with which he bore physical suffering.

I made his acquaintance in October, 1871, when, as one of the Bell scholars, Shenstone entered the laboratory of the Pharmaceutical Society in Bloomsbury Square, where I was then demonstrator. After my removal to Clifton College, and feeling the need of an assistant, I was led to think of the young student I had left behind. He accepted the proposal to live under my roof, and thus was laid the foundation of a friendship which persisted without a check to the end. In 1875 Shenstone left me on his appointment as science master at Taunton College, and after about two years removed to Exeter School to take up a similar appointment. Here he built and fitted up a school laboratory, which he described in NATURE (July 25, 1878), and which proved that, con-